Production Technology of Grasspea

Scientific name : *Lathyrus sativus L.*

Family : Leguminosae.

Importance

Grass pea (*Lathyrus sativus L.*) is a crop of immense economic significance, especially in developing nations including India, Bangladesh, Pakistan, Nepal and Ethiopia. It serves a variety of purposes including food, feed and fodder, owing in part to its nutritive qualities. Prior to domestication, the crop was presumably present as a weed among other pulse crops.

Origin

The origin of *Lathyrus sativus* is unknown; however, its presumed center of origin is South west and Central Asia (Smartt, 1990). Its chromosome complement is 2n = 2x = 14.

Variety

BARI khesari 1, BARI khesari 2, BARI khesari 3, BARI khesari 4.

Climate

Grass pea, inherently capable of withstanding temperature extremes is grown across diverse regions that receive an average annual precipitation ranging from 300 to 1500 mm. In addition to remarkable tolerance to drought, *Lathyrus* has tolerance to excess precipitation and flooding. It thrives best in areas with 10-25°C (Kay, 1979). The mean temperature fluctuations during the growing season ranges from 30 to 10°C with annual rainfall ranging from 600-1200 mm (Telaye, 1988).

Soil

Grasspea grows well on almost all types of soil and in areas receiving 380-650 mm. Loam to clay loam soil are good for grasspea cultivation. It is a hardy crop suited to dry climates, producing good seed crops on poor soils. Grasspea is commonly cultivated on heavy clay soils. Black deep retentive soils are considered best for grasspea (Duke, 1981). It is sensitive to acidity and requires lime on acid soils (Duke, 1981). It has a hardy and penetrating root system suited to a wide range of soil types including very poor soil and heavy clays.

Land preparation

Generally the crop may be sown as pure or in mixed stand often into a standing rice crop. For single crop cultivation 3-4 Ploughing with laddering should be done.

Time of sowing

- For relay crop: Mid October to November.
- For single crop: November to December.

Method of Sowing

- The crop may be sown broadcasting as pure or in mixed stand often into a standing rice crop one to two weeks before rice is ready to harvest.

- For line sowing, Row to Row space 50 cm.

Seed rate

▲ 40-50 kg/ha.

Fertilizer Application

Fertilizer	Quantity/ ha
Urea	40-50 kg
TSP	80-85 kg
Mop	30-40 kg
Biofertilizer	Adequate amount

All fertilizer should be applied in final land preparation. For first time grasspea cultivation, 100 g (for 1 kg seed) biofertilizer may be applied.

Disease and Pest

Major fungal diseases of grasspea are grey mold, rust, powdery mildew and downy mildew. Spraying Redomil MZ (2 %) 3 times at 12 days interval for Downy mildew disease.

Harvesting

Time: The crop are harvested in Mid February to Mid March.

Maturity symptoms: Seeds of grasspea are harvested as soon as the leaves begin to turn yellow and when pods are not fully ripe as fully ripe pods dehisce and scatter the seeds (Kay, 1979).

Method: It is harvested with sickle or uprooted, left to dry for a few days in heaps and then threshed and winnowed.

Yield

1.5-2 ton/ ha.

Production Technology of Pea

Botanical Name: *Pisum sativum L.*

Family: Leguminosae.

Importance

Pea is an important vegetable and generally cultivated for its green pods. It is highly nutritive and is rich in protein. It is used as a vegetable or in soup, canned frozen or dehydrate. It is cooked as a vegetable along or with potatoes. Split grains of pea are widely used for dal. Pea straw is a nutritious fodder.

Variety

BARI motor 1 is the high yielding variety in Bangladesh.

Early Variety: Early Bejar, Arket. **Mid season Variety:** Bonevilla, Jawahar.

Climate

Pea is a cool season crop and performs best at 10^0 C to 18^0 C. The flower and young pods are badly affected by frost. The germination of seeds takes place at 3.3^0 C soil temperature. Boswell (1920) reported that as the temperature increases during the growing season the yield decline sharply. The optimum mean monthly temperature for pea is 12.8^0 C to 18^0 C.

Soil

Pea can be grown on a wide range of soil types, from light sandy to heavy clay. Field pea has moisture requirements similar to those of cereal grains. However, peas have lower tolerance to saline and water logged soil conditions than cereal grains. Peas will not survive long in water logged conditions. Poorly drained and saline soils should be avoided when growing field pea.

Sowing of Seed

Sowing Time: Generally pea sown as relay crop into amon rice. The pea is generally sown in rabi season from the beginning of October to mid of November. Sowing of seed during the first week of November is proper time to get higher yield.

Seed Rate: The optimum seed rate is 25 to 30 kg/ha. As relay crop, it required some more.

Method of Sowing: The pea is generally sown by broadcasting. But it may also be sown by dibbling or behind the plough. The seeds are soaked in water overnight before sowing for better germination. Seeds treated with Rhizobium culture give higher yield. Pal Sodkar et al. (1974) reported with soaking of seeds in G. A 10 ppm for 12 hour gave the highest germination and yield.

Layout and Spacing: Flat bed layout is used. Spacing is 45 X 20 cm.

Fertilizer Application

Fertilizer	Amount (Kg/ha)
Urea	40-45
TSP	80-85
MoP	55-60
Zinc Sulphate	7-7.5
Borax	7-7.5

All fertilizer should be applied during final land preparation.

Intercultural Operation

Trailing and Staking: This is an important operation to be done when vines were about two month old and are at spreading stage. Generally the plants should be supported on bamboo sticks. Delay in this operation will reduce the yield considerably.

Weed Control: It is very difficult to control the weeds by mechanical methods as the crops are sown in rows in closed spacing. Uses of herbicides have been proved very such effective. Atrazine, propazine and simazine @ 0.54 kg per acre gave good broad leaf weed control. Prometryne @ 400 g per acre was most effective in improving vegetative growth and yield of pods.

Irrigation

Water requirement of pulse crops are higher than cereals. The water requirement of pea depends largely on Agronomic condition of the locality. The crop may be irrigated at both 10 days interval. Where rainfall is low, peas irrigation is very necessary at flowering and grain development stage.

Disease and Pest

Main disease of Pea are Blights, Root Rots, Stem Rot, Powdery Mildew etc. Main Insect Pest are Pea Aphids, Lygus Bug, Grasshoppers etc. They control by taken proper management practices.

Harvesting

Maturity symptoms: Peas are harvested for table use when the pods are will fill and the young tender peas changing in colour from dark to light green.

Time: Peas may be picked in 45 to 60 days, 75 days and 100 days according to early, Mid season and late airtimes respectively. Fresh unshielded peas may be kept 90-95% relative humidity. Mid February to Late February is harvesting time for BARI motor 1.

Yield

- **BARI motor 1:** 1.2 ton/ha.
- **Early Variety:** 25 to 40 Quintals/ha.
- **Mid Season and Late:** 50 to 60 Quintals/ha.

Production Technology of Chickpea

English name: Chickpea, Gram.

Scientific name: *Cicer arietinum.*

Family: Fabaceae.

Importance

Chick pea is one of the oldest pulse cash crops and cultivated throughout India Subcontinent since ancient times. Chickpea is popularly known as “Bengal Gram” (or) “Chana”. Chickpea is consumed as vegetable as well as fodder for livestock/animals. Chickpea can be made into split pulse (Chana Dal) and flour (besan). Variety of snacks, sweets and dishes can be made out of chickpea flour.

Variety

BARI chhola 2 (Boral), BARI chhola 3 (Varendro), BARI chhola 4 (Jora ful), BARI chhola 5 (Pabnai), BARI chhola 6 (Navarun), BARI chhola 7, BARI chhola 8, BARI chhola 9.

Climate

Chickpea crop grows well under good moisture conditions with ideal temperatures between 24º-30ºC. Chickpeas are cultivated under both irrigated and rainfed conditions. Basically chickpea is a cool season annual crop and prefers diurnal cycle of cool (17.8°- 21°C) nights and warm (21°- 26.7°C) days. This crop does not tolerate frost especially @ flowering stage as this will damage the seed development in the pod. Annually 65 to 95 cm rainfall is required for its cultivation. Excessive rains after sowing, flowering stage and seed maturity stage will result in heavy loss in crop yield.

Soil

Loam and clay loam soils are suitable for chickpea cultivation. It can be grown on soils having pH range of 6.0-9.0 although it is sensitive to salinity and alkalinity. Chickpea grows in fertile sandy loam and well drained soils.

Land Preparation

The land should be prepared by 3-4 Ploughing, cross ploughing with laddering.

Method of Sowing

Broadcasting and Line sowing can be done. For line sowing, Row to Row distance 40 cm.

Seed Rate

- Broadcasting: 50-60 kg/ha.
- Line sowing: 45-50 kg/ha.

Time of sowing

20 November – 10 December.

Fertilizer Application

Fertilizer	Quantity/ ha
Urea	40-50 kg
TSP	80-90 kg
MoP	30-40 kg
Boric Acid	10-12 kg
Biofertilizer	5-6 kg

All fertilizer should be applied at final land preparation. Biofertilizer can be used 80 g/ kg of seed. If inoculum fertilizer applied then no need to application of Urea.

Irrigation

Chickpea can be cultivated mainly as rainfed crop. This crop requires light irrigations. Excessive watering should result in extra vegetative growth and reduces the yield of chickpea. If this crop is cultivated under irrigated condition, pre-sowing irrigation is required for better germination of the seed. In case of no rains, give 1 irrigation @ pre-flowering, 1 irrigation @ flowering stage and 1 irrigation @ pod developing stage. Chickpea crop does not tolerate water stagnation in the field. Hence provide good internal drainage in the field.

Intercultural operation

Weed Control: Chickpea crop is more prone to infestation of weeds. Weed should be controlled at 30-35 days after emergence. 2nd weeding should be given after 2 months of sowing. Herbicides can also be used to control the weeds in chickpea crop. Apply pre-emergence fluchloralin 1 kg as basal/ha in 900 liters of water. It should be applied in the soil before sowing the seeds.

Pests and Diseases

▲ Cutworms and Pod Borer are main pests in chickpea farming.

Cutworms : To control this, apply Lindane 6% granules @ 20-30 kg/ha mixed in the soil.

Pod Borer: To control this, apply spray of Endosulfan 35 EC @ 1.30 liters mixed in 900- 1000 liters of water/ha.

▲ Wilt, Botrytis Grey Mold, Sclerotinia Blight, Rust and Ascochyta Blight are the main diseases in chickpea farming.

Wilt : This is mainly caused by fungus, Treating the seeds with a mixture of Benlate of Thiram (1:1) @ 2.5 g per kg of seed will control these diseases. Deep planting of seeds also control this to some extent.

Botrytis Grey Mold: Spraying the crop with 0.2% Bavistin will control this. Late sowing also reduces the chances of this disease.

Sclerotinia Blight: Choose healthy seeds and treat the field soil with a mixture Captan & Brassicol @ 12 kg per/ha to control this disease.

Rust: To control this disease in chickpea crop, spray the chickpea crop with 0.2% Mancozeb 75 WP followed by 2 more sprays @ 9 to 10 days interval. Choosing "Rust" resistant varieties will help in avoiding this type of disease.

Ascochyta Blight: To control this, follow the crop rotation and treat the seeds with Thiram or Bavistin @ 2.5 g/kg of seed before sowing.

Harvesting

Chickpea crop will be ready for harvesting after leaves turn reddish-brown and start shedding from the plant. Using sickle or hand, plants should be plucked. Should allow the crop to dry in sun for about a week and threshing should be carried out by beating the plants with sticks.

Yield

1.5-2 ton/ha.

Production Technology of Black gram

English name: Black gram.

Scientific name: *Vigna mungo.*

Family: Fabaceae.

Importance

Black gram is popularly known as "Mashkalai" is one of the most important pulses crop, grown across Bangladesh. This crop is resistant to adverse climatic conditions and improve the soil fertility by fixing atmospheric nitrogen in the soil. This crop is grown primarily for its protein rich seeds and used as daal and as main ingredient in breakfast.

Variety

BARI Mash 1(Pantho), BARI mash 2 (Shorot), BARI mash 3 (Hemonto).

Climate

▲ It is generally grown in kharif/rainy and summer season.

▲ It grows best in hot and humid condition with ideal temperature range between 25 to 35^0 C.

▲ It can be grown successfully from sea level up to an elevation of 1800 meters.

▲ Heavy rains during flowering are harmful.

▲ It is best suited to areas having an annual rainfall of 60 to 75 cm.

Soil

Soil in Black Gram cultivation should have neutral pH. Loam or clay loam soils are best suited soils for it's cultivation. Adding higher organic matter in soil will result in vigorous seed production.

Land Preparation

The land should be prepared by 2-3 ploughing, cross ploughing with laddering.

Method of sowing

Broadcasting and line sowing can be done. For line sowing, Row to row distance 30 cm. Broadcasting can be done in Kharif-2 season. Seeds should not be sown more than 5 to 6 cm in depth.

Seed Rate

35-40 kg/ha.

Seed treatment

♦ Seed should be treated with thiram @ 2.5 g / kg seed.

♦ It should be treated with rhizobium culture for atmospheric N fixation.

Time of sowing

- In Kharif-1 season: Late February to Mid March.
- In Kharif-2 season: 15 August to 31 August.

Fertilizer Application

Fertilizer	Quantity/ ha
Urea	40-50 kg
TSP	85-95 kg
MoP	30-40 kg
Biofertilizer	4-5 kg

All fertilizer should be applied at final land preparation. Biofertilizer can be used 80 g/ kg of seed. If inoculum fertilizer applied then no need to application of Urea.

Weed control

Immediately after sowing and watering, Basalin weedicide is sprayed by dissolving 2 ml of Basalin/liter water. The weedicide spraying must be done within 3 days of sowing. If it is done later, it can damage the crop. Applying weedicide will control the early growth weeds, to control later emerging weeds in the crop, manual weeding should be done after 2 weeks.

Irrigation

Irrigation is not needed in rainy season, but in summer season irrigation should be given as per critical stages and availability of irrigation water. Number and frequency of irrigation depend upon the soil type and weather. The crop should get irrigation at an interval of 10-15 days. From flowering to pod development stage, there is need of sufficient moisture in the field.

Disease and Pest

▲ YM virus, Leaf curl, Seed rot, Anthracnose are main disease of Black gram.

1. YM virus: Spray Metasystox & Melathion.

2. Leaf curl: 2-3 sprays of Metasystox at 10 days interval.

3. Seed/seedling rot: Seed treatment with Thiram/carbendazim 2.5 g/kg seed.

4. Anthracnose: Spray Mancozeb/zineb @ 2 kg in 1000 lit. of water.

▲ Hairy caterpillar, leaf hopper and jassids are main insect pest of Black gram.

1. Hairy caterpillar: Dusting 2n % methyl parathion @25-30kg/ha.

2. Leaf hopper: Basal application of Phorate @ 10 kg/ha. Spray monocrotophos @ 1ml/lit. of water.

3. Jassids: Basal application of Phorate @ 10 kg/ha. Spray monocrotophos @ 1ml/lit. of water.

Harvesting

Time- Kharif-1: Early May.

Kharif-2: Late October.

Pods and plant dried, Grains become hard and moisture % in grain at harvesting should be 20-22%. The ripened pods can be collected from the plants in one or two pickings and dried on the floor. If the plants come to harvest, then the crop should cut and the plants spread over the floor to dry. The plants becomes dry and turn into black and pods may start splitting. The plants should be beaten using pliable sticks to prevent damage to seeds. Then seeds are separated from pods. These plants after harvesting can be used as fodder for animals.

Yield

1.5-1.8 ton/ha.

Production Technology of Pigeon Pea

English Name: Pigeon Pea.

Botanical Name: *Cajanus cajan syn. Cajanus indicus.*

Family: Fabaceae.

Importance

The pigeon pea is a perennial legume. Its seeds have become a common food grain in Asia, Africa, and Latin America. It is consumed on a large scale mainly in south Asia and is a major source of protein for the population of that subcontinent. In Bangladesh, Pigeon Pea is more popular as Arhar. In regions where it grows, fresh young pods are eaten as a vegetable. Split pigeon peas are one of the most popular pulses, being an important source of protein in a mostly vegetarian diet.

Varieties

Some Indian varieties are ICPL-87, GT-101, BDN-2, ICPH 2740, Vaishali, GT-9 etc.

Climate

Pigeon pea grows well in warm tropical and subtropical climate. The crop prefers a fairly moist and warm climate during the period of its vegetative growth during the flowering and repining stages of its growth, its requires bright sunny weather for the setting of fruits. It is highly susceptible to frost at the time of flowering. Cloudy weather and excessive rainfall at flowering time damage the crop to great extent.

- 30 – 35°C during germination.
- Slightly lower temperature (20 -25°C) during active vegetative growth.
- During flowering and pod setting it requires 15-18°C temperature and at maturity it needs higher temperature of around 35 – 40°C.
- Arhar crop requires average rainfall of 600-650 mm with moist conditions for the first eight weeks and drier conditions during flowering and pod development stage, this will result in highly successful crop.

Soil

Pigeon Pea may be grown well, on a wide range of soils varying from sandy loams to clay loams. It does best on fertile and well drained loamy soils. The saline-alkaline and waterlogged soil unfit for its cultivation. It grows well in well drainage red clay loam soil too. It can be grown successfully on neutral soils having a pH range of 6.5 to 7.5.

Land Preparation

Pigeon pea being a deep rooted crop responds well to proper tilth. So land is prepared by at least one ploughing during the dry season followed by 2 or 3 harrowings and disc ploughing.

Seed Rate

The seed rate is 15 kg/ha.

Seed Treatment

Treat the seeds with Carbendazim or Thiram @ 2 g/kg of seed 24 hours before sowing (or) with powder formulation of *Trichoderma viride* @ 4g/kg of seed (or) *Pseudomonas fluorescens* @ 10 g/kg seed.

Spacing

♣ Rainfed condition: Row to Row: 90-120 cm.

Plant to plant: 30 cm.

♣ Irrigated Condition: Row to Row: 50-75 cm.

Plant to plant: 15-20 cm.

Planting Time

Pigeon pea is a traditionally Kharif crop sown in June – July.

Manuring

15 kg N and 45 kg P_2O_5 per hectare is sufficient for this crop.

Intercultural Operation

Two weeding and hoeing are essential for the crop. Once about 25-30 days and another about 45-50 days after sowing the crop.

Irrigation

Irrigation may be done at pre-sowing stage and in absence of rains at flowering and pod development stage.

Disease and Pest

▲ Major Diseases are Wilt, Phytopthora blight.

Wilt: seed treatment with Carbendazim + Thiram or Carbendazim @ 2g/kg seed. Inter cropping of Pigeon pea with sorghum.

Phytophthora blight: Ridge sowing and good drainage. Avoid sowing of pigeon pea in low lying fields. Seed treatment with Metalaxy1 @ 4 g/kg seed. Foliar spray of Metalaxy1 + Mancozeb (0.3%) in standing crop to minimize the disease.

▲ Main insect pest are Pod Fly, Pod Bug and Pod borer.

Pod fly and pod bug: Spraying Dimethoate 0.03%.

Pod borer Complex: Spraying Dimethoate 0.03% or Fenvalerate 0.02% or Monocrotophos 0.04% or cypermethrin 0.004%.

Harvesting

Maturity symptoms: In pigeon pea Farming, Green pigeon pea pods are harvested for different purposes. Fully developed, bright green seed is preferred for use as a vegetable. Hence, pods should be harvested just before they start loosing their green color. For this normally hand picking is followed. Pigeon pea leaves, unlike other crops remain green when the pods are ready for harvest. Pigeon pea should be harvested when 75-80% of the pods turn brown and are dry. Delayed harvesting, during bad-weather, may increase the risk of damage to mature seed.

Methods: Traditionally pigeon pea plants are harvested by cutting the stem at the base with a sickle, but occasionally machines are used for cutting and followed by drying and threshing.

Threshing- The harvested plants are bundled and placed upright to dry for a week depending on the weather conditions. Pods and grain are separated by beating the dry plants with sticks or by using a thresher. In some places by cattle trampling seeds are separated.

Storing

Pigeon pea is usually stored for long periods to ensure availability of whole seed at the time of sowing, and as a dhal to meet consumer requirement.

Yield

ICPH 2740 variety yield is 3 ton/ha.